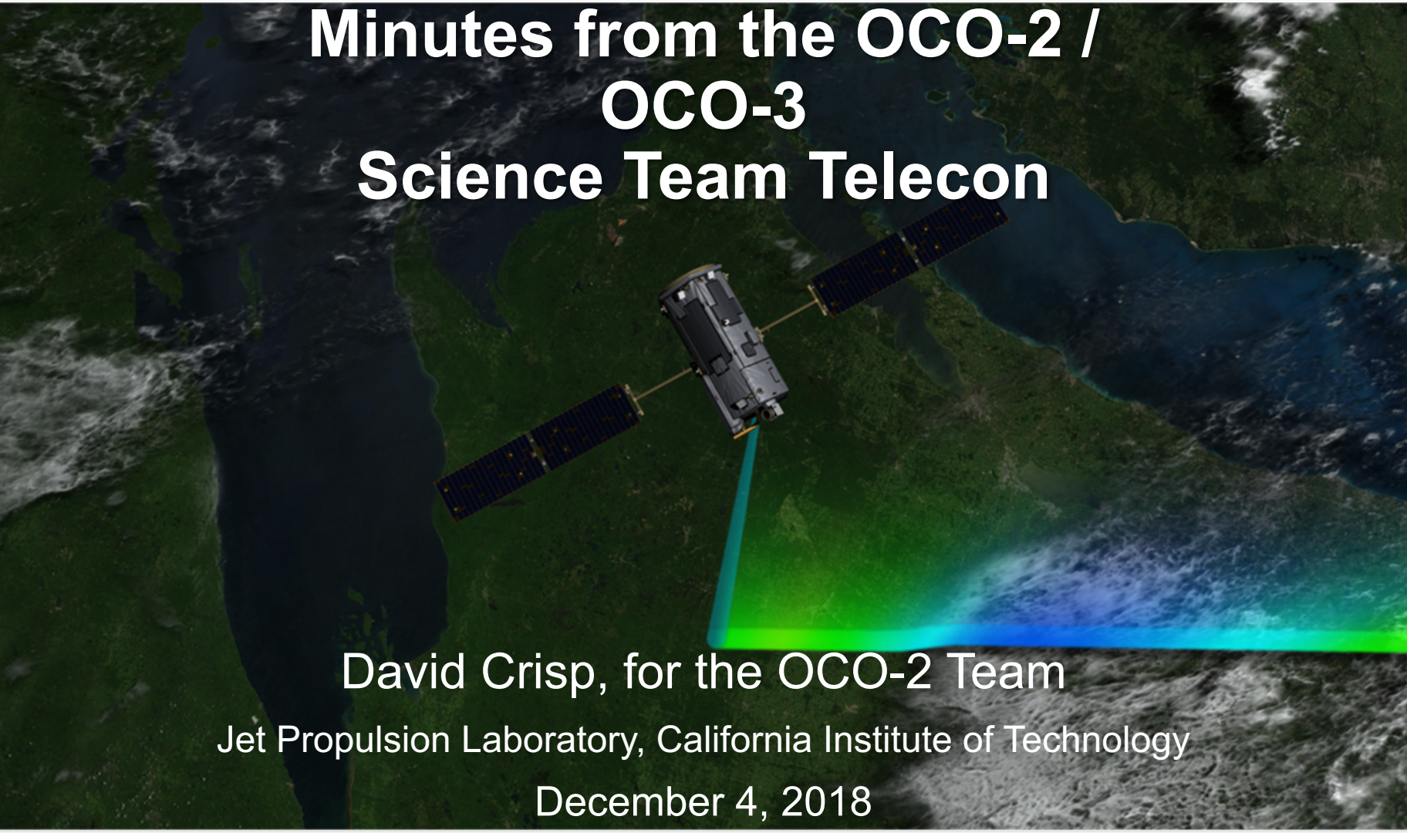
Minutes from the OCO-2 / OCO-3 Science Team Telecon



David Crisp, for the OCO-2 Team

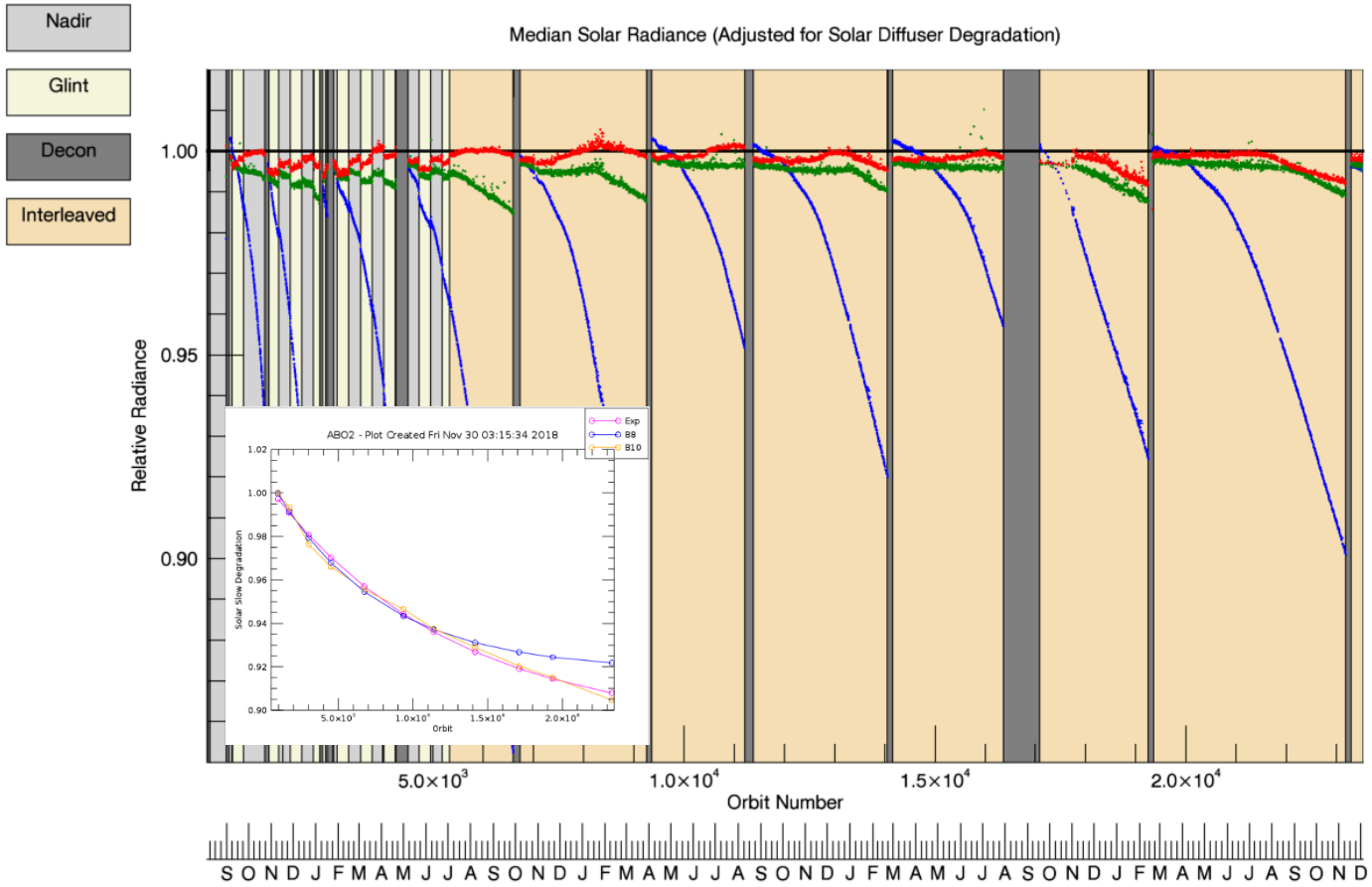
Jet Propulsion Laboratory, California Institute of Technology

December 4, 2018

Status Summary

- Observatory Status: Nominal
  - Next Drag Makeup Maneuver (DMM) tentatively scheduled for 10 March 2019 to coincide with an Inclination Angle Maneuver (IAM)
- Instrument Status: Nominal
  - Return to science: November 26, restart of Forward stream
  - Error in slow degradation correction identified
- Science Status: Nominal
  - "Build 10" testing plan beginning to come together
  - ACOS/GOSAT version 9, slowly coming together
    - EOFs still needed
    - Production schedule being reviewed
- AGU Planning

Throughput Trending



An error in the slow degradation correction (Blue line in inset) introduced a small (~1%) radiometric error in the ABO2 throughput in the v8 product.

Recent Publications (1)

- Hedelius, J. K., Liu, J., Oda, T., Maksyutov, S., Roehl, C. M., Iraci, L. T., Podolske, J. R., Hillyard, P. W., Liang, J., Gurney, K. R., Wunch, D., and Wennberg, P. O.: Southern California megacity CO_2, CH_4, and CO flux estimates using ground- and space-based remote sensing and a Lagrangian model, Atmos. Chem. Phys., 18, 16271-16291, doi:10.5194/acp-18-16271-2018, 2018.
- Lu, X. C. Cheng, X ., Li, X. L., Chen, J. Q., Sun, M. M., Ji, M., He, H., Wang, SY, Li, S., Tang, J. W., Seasonal patterns of canopy photosynthesis captured by remotely sensed sun-induced fluorescence and vegetation indexes in mid-to-high latitude forests: A cross-platform comparison, Science of the Total Environment, 664, 439-451, DOI: 10.1016/j.scitotenv.2018.06.269, 2018.
- Yin, S., Wang, X. F., Tani, H., Zhang, X. R., Zhong, G. S., Sun, Z. Y., Chittenden, A. R., Analyzing temporo-spatial changes and the distribution of the CO2 concentration in Australia from 2009 to 2016 by greenhouse gas monitoring satellites, Atmospheric Environment, 192, 1-12, DOI: 10.1016/j.atmosenv.2018.08.043, 2018.
- Zhang, Z. Y., Zhang, Y. G., Joiner, J., Migliavacca, M., Angle matters: Bidirectional effects impact the slope of relationship between gross primary productivity and sun-induced chlorophyll fluorescence from Orbiting Carbon Observatory-2 across biomes, Global Change Biology, 24, 5017-5020, DOI: 10.1111/gcb.14427, 2018.

Recent Publications (2)

- Frankenberg, C., Kohler, P., Magney, T. S., Geier, S., Lawson, P., Schwochert, M., McDuffie, J., Drewry, D. T., Pavlick, R., Kuhnert, A., The Chlorophyll Fluorescence Imaging Spectrometer (CFIS), mapping far red fluorescence from aircraft, Remote Sensing of Environment, 217, 523-536, DOI: 10.1016/j.rse.2018.08.032, 2018.
- Kohler, P., Frankenberg, C., Magney, T. S., Guanter, L., Joiner, J., Landgraf, J., Global Retrievals of Solar-Induced Chlorophyll Fluorescence With TROPOMI: First Results and Intersensor Comparison to OCO-2, Geophysical Research Letters, 45, 10456-10463, DOI: 10.1029/2018GL079031, 2018.
- Others …

Publications in Press (discussion closed)

- O'Dell, C. W., Eldering, A., Wennberg, P. O., Crisp, D., Gunson, M. R., Fisher, B., Frankenberg, C., Kiel, M., Lindqvist, H., Mandrake, L., Merrelli, A., Natraj, V., Nelson, R. R., Osterman, G. B., Payne, V. H., Taylor, T. R., Wunch, D., Drouin, B. J., Oyafuso, F., Chang, A., McDuffie, J., Smyth, M., Baker, D. F., Basu, S., Chevallier, F., Crowell, S. M. R., Feng, L., Palmer, P. I., Dubey, M., García, O. E., Griffith, D. W. T., Hase, F., Iraci, L. T., Kivi, R., Morino, I., Notholt, J., Ohyama, H., Petri, C., Roehl, C. M., Sha, M. K., Strong, K., Sussmann, R., Te, Y., Uchino, O., and Velazco, V. A.: Improved Retrievals of Carbon Dioxide from the Orbiting Carbon Observatory-2 with the version 8 ACOS algorithm, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2018-257, in review, 2018.
- Hakkarainen, J., Ialongo, I., Maksyutov, S., and Crisp, D.: Global XCO2 anomalies as seen by Orbiting Carbon Observatory-2, Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2018-649, in review, 2018.
- Buchwitz, M., Reuter, M., Schneising, O., Noël, S., Gier, B., Bovensmann, H., Burrows, J. P., Boesch, H., Anand, J., Parker, R. J., Somkuti, P., Detmers, R. G., Hasekamp, O. P., Aben, I., Butz, A., Kuze, A., Suto, H., Yoshida, Y., Crosp, D., and O'Dell, C.: Computation and analysis of atmospheric carbon dioxide annual mean growth rates from satellite observations during 2003–2016, Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-158, in review, 2018.

Publications in Review

- Kiel, M., O'Dell, C. W., Fisher, B., Eldering, A., Nassar, R., MacDonald, C. G., and Wennberg, P. O.: How bias correction goes wrong: Measurement of XCO2 affected by erroneous surface pressure estimates, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2018-353, in review, 2018.
- Nelson, R. R. and O'Dell, C. W.: The Impact of Improved Aerosol Priors on Near-Infrared Measurements of Carbon Dioxide, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2018-366, in review, 2018.
- Kulawik, S. S., O'Dell, C., Nelson, R. R., and Taylor, T. E.: Validation of OCO-2 error analysis using simulated retrievals, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2018-368, in review, 2018.
- Eldering, A., Taylor, T. E., O'Dell, C. W., and Pavlick, R.: The OCO-3 mission; measurement objectives and expected performance based on one year of simulated data, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2018-357, in review, 2018.
- Wang, H., Jiang, F., Wang, J., Ju, W., and Chen, J. M.: Differences of the inverted terrestrial ecosystem carbon flux between using GOSAT and OCO-2 XCO2 retrievals, Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-1175, in review, 2018.

Preparations for AGU

- Oral and Poster talks
  - See following slides – same as previously distributed, but included for completeness
- OCO-2/OCO-3 Hyperwall: Tuesday 12/11 10:30 – 10:45 AM
- GeoCarb Flash Talk: 2:40 PM Wednesday 12/12
- GOSAT/OCO-2/GOSAT-2/OCO-3/GeoCarb/TROPOMI Technical Interchange Meeting (2-5 PM on Tuesday 11 December).
  - Plans coming together and venue is being arranged
- SIF Technical Workshop (Karen Yuen is the point of contact)
  - focused on developing SIF communities and studies, as well as combining other SIF measurements with OCO-2.
  - Date and Time: Wednesday, 12 December 2018: 08:00 - 12:20
    Location: Grand Hyatt, Room: Declaration AB

AGU Sessions of Interest

Rob Nelson compiled a list of AGU Sessions that might be of interest to the OCO-2 / OCO-3 / GOSAT / GOSAT-2 / GeoCarb teams

- blue = remote sensing of GHGs

- **Monday, 10 December 2018**
- **GC13B**: Carbon Cycle Climate Variability: Observation, Modeling, and Data Assimilation in the Modern Data-Rich Era I (13:40-15:40)

- **Tuesday, 11 December 2018**
- **B21J**: Carbon Monitoring Systems Research and Applications I Posters (8:00-12:20)

Tuesday afternoon looks clear, and is being considered for the 2018 annual GOSAT/OCO-2 Technical Interface Meeting (TIM)

AGU Wednesday, 12 December 2018

- **A31P**: Lidar Investigations of Greenhouse Gases, Aerosols, and Clouds I Posters (8:00-12:20)
- **A31M**: Emissions of Atmospheric Pollutants from Oil, Gas, and Coal Operations II Posters (8:00-12:20)
- **B31N**: Sun-Induced Chlorophyll Fluorescence as a Proxy of Photosynthesis: Measurements, Modeling, and Applications from Field, Airborne, and Satellite Platforms Posters (8:00-12:20)
- **A33C**: Emissions of Atmospheric Pollutants from Oil, Gas, and Coal Operations I (13:40-15:40)
- **B33C**: Sun-Induced Chlorophyll Fluorescence as a Proxy of Photosynthesis: Measurements, Modeling, and Applications from Field, Airborne, and Satellite Platforms I (13:40-15:40)
- **A33J**: Atmospheric Monitoring from Space: The Copernicus S5P and Suomi NPP Constellation I Posters (13:40-18:00)
- **B34C**: Sun-Induced Chlorophyll Fluorescence as a Proxy of Photosynthesis: Measurements, Modeling, and Applications from Field, Airborne, and Satellite Platforms II (16:00-18:00)
- **A34G**: Lidar Investigations of Greenhouse Gases, Aerosols, and Clouds II (16:00-18:00)

AGU: Thursday, 13 December 2018

- **B41A**: Carbon Monitoring Systems Research and Applications II (8:00-10:00)
- **A41C**: Constraining Biosphere–Atmosphere Exchange Processes Using Remote Sensing and in Situ Observations I (8:00-10:00)
- **B42A**: Carbon Monitoring Systems Research and Applications III (10:20-12:20)
- **A42B**: Atmospheric Monitoring from Space: The Copernicus S5P and Suomi NPP Constellation II (10:20-12:20)
- **A43H**: Remote Sensing of CH4 and CO2 from Space: New Observing System Capabilities I (13:40-15:40)
- **A43N**: Constraining Biosphere–Atmosphere Exchange Processes Using Remote Sensing and in Situ Observations II Posters (13:40-18:00)
- **A43P**: Rising Atmospheric Methane: Causes and Consequences II Posters (13:40-18:00)
- **A43R**: Understanding and Attributing Greenhouse Gas Fluxes from Urban Systems and Major Hot Spots I Posters (13:40-18:00)
- **A44E**: Remote Sensing of CH4 and CO2 from Space: New Observing System Capabilities II (16:00-18:00)

AGU Friday, 14 December 2018

- **A51D**: Rising Atmospheric Methane: Causes and Consequences I (Fri. 8:00-10:00)
- **B51G**: Emergent Behavior in the Terrestrial Carbon Cycle I Posters (8:00-12:20)
- **B51E**: Carbon Feedbacks in Earth's Climate System: Beyond Emergent Patterns and Toward Mechanistic Processes to Reduce Future Climate Uncertainty Posters (8:00-12:20)
- **A51R**: Remote Sensing of CH4 and CO2 from Space: New Observing System Capabilities III Posters (8:00-12:20)
- **A52G**: Understanding and Attributing Greenhouse Gas Fluxes from Urban Systems and Major Hot Spots II (10:20-12:20)
- **A53F**: Understanding and Attributing Greenhouse Gas Fluxes from Urban Systems and Major Hot Spots III (13:40-15:40)
- **B54A**: Emergent Behavior in the Terrestrial Carbon Cycle II (16:00-18:00)
- **A54G**: Understanding and Attributing Greenhouse Gas Fluxes from Urban Systems and Major Hot Spots IV (16:00-18:00)

Technical Interchange Meeting

- The Annual GOSAT – OCO-2 Technical Interchange Meeting is scheduled from 2 – 5 PM on Tuesday December 11
- Venue: Renaissance Washington DC Downtown Hotel
  - 999 9th St NW, Washington, DC 20001 - 2 blocks south of convention center
  - Room: Grand South
- This year we have extended the invitation to GOSAT-2, OCO-3, Sentinel 5p TROPOMI and GeoCarb Science Team members
- A preliminary agenda is in preparation and will be distributed later this week
  - How do we reduce the ~0.6 – 1.0 ppm bias limitation
  - Topics include mission status, new product plans, calibration and validation campaigns, joint publication plans
  - If you would like to make a presentation, please let me know ASAP

WS21: Applications and User Development on Solar-Induced Chlorophyll Fluorescence (SIF) Data Products from Spaceborne Platforms

Wednesday, 12 December 2018 08:00 - 12:20 , Grand Hyatt - Declaration AB

Workshop Agenda

Introduction of SIF

Discovery and Development of space-based SIF measurements - Dr. Christian Frankenberg (30 mins)

Current Uses and Applications of available SIF data products

1) SIF data from Leaf to Satellite and examples for Crop studies- Dr. Troy Magney (20 minutes)

2) Using SIF as a proxy for GPP - Dr. Ying Sun (20 minutes)

3) Using SIF and NDVI- Dr. Compton Tucker (20 minutes)

Overview, Discussion and Tutorial on current SIF Products

1) Overview and Discussion of current SIF products from GOSAT, GOME-2, OCO-2 and TROPOMI - Dr. Philipp Koehler (30 mins)

2) SIF data products from TanSat - Dr. Liangyun Liu (20 mins)

In addition to showing where to pull data from various sources, the tutorial using case studies will include an Introduction to MEaSUREs project (Multi-Decadal Time Series of Vegetation Chloropyll Fluorescence and Derived Gross Primary Production). The plan is to have preliminary data available for testing by potential users. (Frankenberg, Parazoo, Magney, Koehler, Sun and Yuen) (130 minutes)

3) Case Study: Creating a Time series of SIF data at a particular location

4) Case Study: Normalization and correction of SIF measured at different times of day and wavelengths

5) Case Study: How to work with/combine SIF data products from different sensors